MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

TCC 3141 – CLOUD COMPUTING

(All Sections / Groups)

16th OCTOBER 2018
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 8 printed pages including cover page with **TWO** sections:
   Section A: Four Structured Questions
   Section B: One Structured Question

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

Section A: Theory and Application

Instruction: Answer all questions.

Question 1 [10 Marks]

(a) Scaling is the ability of the information technology (IT) resource to handle increased or decreased usage demands. There are **TWO (2)** types of scaling: horizontal and vertical.

Draw a suitable diagram to show the configuration for each scaling.

[2 marks]

(b) Describe the type of cloud services provided by the following cloud delivery models:

(i) Infrastructure-as-a-Service (IaaS)
(ii) Platform-as-a-Service (PaaS)
(iii) Software-as-a-Service (SaaS)

[3 marks]

(c) Draw a diagram showing the configuration of an operating system (OS)-based virtualization technology.

Discuss **THREE (3)** ways hardware-based virtualization technology can be used to address performance overhead in OS-based virtualization technology.

[5 marks]

Question 2 [10 Marks]

(a) How denial-of-service (DoS) compromises the availability of cloud resources?

Describe **THREE (3)** common ways in which denial-of-service (DoS) are carried out in cloud computing environment.

[4 marks]

Continued...

(b)

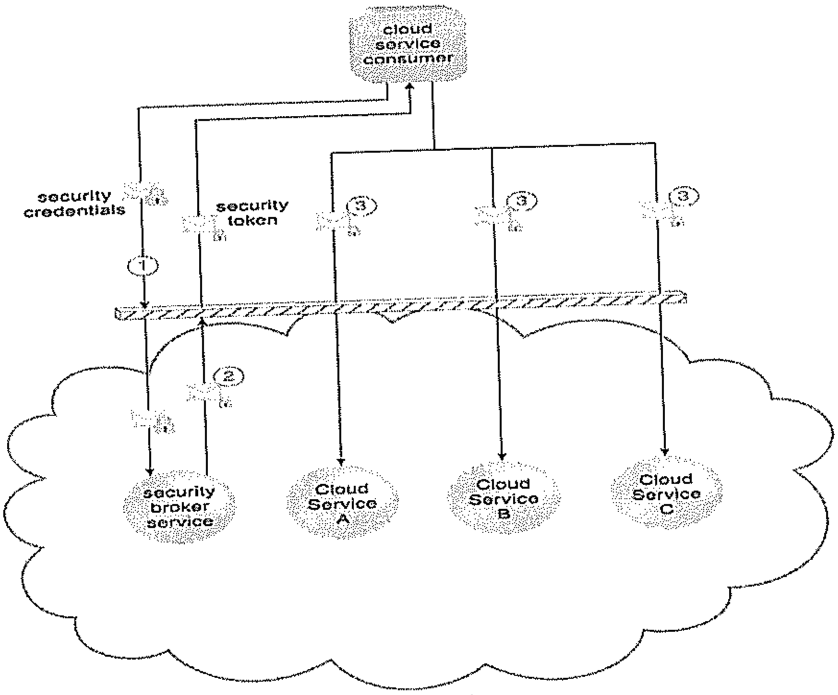

Figure 1

Based on Figure 1 above, explain the **THREE (3)** steps for single sign-on (SSO) mechanism used in cloud environment.

[3 marks]

(c) The cloud usage monitor is a lightweight and autonomous software program responsible for collecting and processing information technology (IT) resource usage data.

Discuss the main function for each of the following cloud usage monitor agents:

i. Monitoring agent.
ii. Resource agent.
iii. Polling agent.

[3 marks]

Question 3 [10 Marks]

(a) There are several tasks that can be performed by cloud consumers via a remote administration control. However, they depends on **THREE (3)** conditions. Explain the conditions.

[3 marks]

Continued ...

(b) Compare between the hierarchical resource pools and nested resource pools. [4 marks]

(c) Aminah in the IT department at Bersatu Manufacturing Company plant is planning for her company to subscribe to a cloud services with advanced architectures. However, Aminah is not certain which advanced cloud architectures fits her company's requirements.

Explain to Aminah what can be established by the following **THREE (3)** advanced cloud architectures:

(i) Hypervisor clustering.
(ii) Load balanced virtual server instances.
(iii) Non-disruptive server relocation.

[3 marks]

Question 4 [10 Marks]

(a) Berry's Chocolates of Bear Hill makes an assortment of chocolate candy and candy novelties. The company has six in-city stores: five stores in major metropolitan airports, and a small online-order branch. Berry's decides to subscribe to a cloud service system that can connect its entire retail outlets.

You, as Database Manager in Berry's, have proposed a subscription to cloud services that implement Dynamic Data Normalization architecture in order to prevent saving redundant copies of data.

Explain **FOUR (4)** issues related to redundant data. [4 marks]

(b) Borhan is a decision maker for Malacca's Authentic Cencaluk Company. He needs to decide which cloud environment to subscribe for his company's expansion plan. Out of **THREE (3)** cloud delivery models, suggest to Borhan which cloud delivery model that provides less administrative control but still offers significant range of management features.

Based on your suggestion, devise **FOUR (4)** set of management features that may be useful for Borhan.

[4.5 marks]

Continued ...

(c) Categorize **THREE (3)** types of measurements for cloud service usage metrics based on each of the following cost charge:

(i) RM 1.50 per 1000 transactions
(ii) RM 100.00 per month
(iii) RM 50.00 per additional user per month.

[1.5 marks]

Section B: CloudSim Programming

Instruction: Answer all questions based on the code below.

```
public class CloudSim_Network_Topology {

    private static List<Cloudlet> cloudletList;

    private static List<Vm> vmlist;

    private static List<Vm> createVM(int userId, int vms, int idShift) {

        LinkedList<Vm> list = new LinkedList<Vm>();

        long size = 10000; //image size (MB)
        int ram = 512; //vm memory (MB)
        int mips = 250;
        long bw = 1000;
        int pesNumber = 1; //number of cpus
        String vmm = "Xen"; //VMM name

        Vm[] vm = new Vm[vms];

        for(int i=0;i<vms;i++){

            vm[i] = new Vm(idShift + i, userId, mips, pesNumber, ram, bw, size, vmm, new
            CloudletSchedulerTimeShared());

            list.add(vm[i]);
            }

        return list;
        }
```

Continued ...

```
private static List<Cloudlet> createCloudlet(int userId, int cloudlets, int idShift){

    LinkedList<Cloudlet> list = new LinkedList<Cloudlet>();

    long length = 40000;
    long fileSize = 300;
    long outputSize = 300;
    int pesNumber = 1;
    UtilizationModel utilizationModel = new UtilizationModelFull();

    Cloudlet[] cloudlet = new Cloudlet[cloudlets];

    for(int i=0;i<cloudlets;i++){

        cloudlet[i] = new Cloudlet(idShift + i, length, pesNumber, fileSize, outputSize,
        utilizationModel, utilizationModel, utilizationModel);

        cloudlet[i].setUserId(userId);
        list.add(cloudlet[i]);
        }

    return list;
    }

  public static void main(String[] args) {

    Log.printLine("Starting CloudSim09...");

    try {
        int num_user = 1;
        Calendar calendar = Calendar.getInstance();
        boolean trace_flag = false;

        CloudSim.init(num_user, calendar, trace_flag);

        Datacenter datacenter0 = createDatacenter("Datacenter_0");
        Datacenter datacenter1 = createDatacenter("Datacenter_1");
        Datacenter datacenter2 = createDatacenter("Datacenter_2");
        Datacenter datacenter3 = createDatacenter("Datacenter_3");
        Datacenter datacenter4 = createDatacenter("Datacenter_4");

        DatacenterBroker broker = createBroker();
        int brokerId = broker.getId();

        vmlist = createVM(brokerId, 5, 0);
        cloudletList = createCloudlet(brokerId, 10, 0);

        broker.submitVmList(vmlist);
        broker.submitCloudletList(cloudletList);
```

Continued ...

```
            NetworkTopology.addLink(datacenter0.getId(), broker.getId(),10.0,15);
            NetworkTopology.addLink(datacenter1.getId(), datacenter0.getId(),10.0,30);
            NetworkTopology.addLink(datacenter2.getId(), datacenter1.getId(),10.0,20);
            NetworkTopology.addLink(datacenter3.getId(), datacenter2.getId(),10.0,40);
            NetworkTopology.addLink(datacenter4.getId(), datacenter3.getId(),10.0,10);

            CloudSim.startSimulation();

            List<Cloudlet> newList = broker.getCloudletReceivedList();

            CloudSim.stopSimulation();

            printCloudletList(newList);
            Log.printLine("CloudSim09 finished!");
            }

        catch (Exception e) {
            e.printStackTrace();
            Log.printLine("The simulation has been terminated due to an unexpected error");
            }
    }

    private static Datacenter createDatacenter(String name){

        List<Host> hostList = new ArrayList<Host>();

        List<Pe> peList = new ArrayList<Pe>();

        int mips = 500;

        peList.add(new Pe(0, new PeProvisionerSimple(mips)));

        int hostId=0;
        int ram = 2048; //host memory (MB)
        long storage = 1000000; //host storage
        int bw = 10000;

        hostList.add(
            new Host(
                hostId,
                new RamProvisionerSimple(ram),
                new BwProvisionerSimple(bw),
                storage,
                peList,
                new VmSchedulerSpaceShared(peList)
                )
            );
```

Continued ...

```
String arch = "x86";
String os = "Linux";
String vmm = "Xen";
double time_zone = 10.0;
double cost = 3.0;
double costPerMem = 0.05;
double costPerStorage = 0.001;
double costPerBw = 0.0;
LinkedList<Storage> storageList = new LinkedList<Storage>();

DatacenterCharacteristics characteristics = new DatacenterCharacteristics( arch, os, vmm,
hostList, time_zone, cost, costPerMem, costPerStorage, costPerBw);

Datacenter datacenter = null;
try {
    datacenter = new Datacenter(name, characteristics, new
    VmAllocationPolicySimple(hostList), storageList, 0);
    } catch (Exception e) {
        e.printStackTrace();
        }

return datacenter;
}
```

(a) Name the network topology that was set-up in the code. Draw the network configuration, and label the bandwidth and latency values (in millisecond) for all network links accordingly.

[3 marks]

(b) Assuming that the time taken to process each cloudlet is 320 ms, and the processing of the first cloudlet, CloudletID 0, in VMID 0 on DataCenterID 0 only begins at 100.5 ms. Table the output of this code using the following format.

CloudletID	VMID	DataCenterID	StartTime	FinishTime

[5 marks]

(c) Rewrite the code for NetworkTopology section to set-up a star network topology with broker as a source destination.

[2 marks]

End of Page.